Memorandum

DATE: July 28, 1999

TO: Janice Johnson

FROM: Susan Poulsom
Jim Peterson

RE: Equation for Annual O&M for Off-line Storage (Draft)

This memo presents the development of an equation to calculate annual O&M costs for off-line storage. The following general assumptions were made regarding the off-line storage facilities:

- The storage facility will include an automated washdown system.
- Gravity flow into and pump out of the storage facility.
- Dewatering pumps would discharge from the storage facility back to the interceptor.
- The pumps would be designed to dewater the facility in 12 hours.

Individual components contributing to the annual off-line storage O&M costs include:

- Maintenance materials
- Labor for scheduled inspections and maintenance
- Maintenance labor following a storm event
- Odor control (carbon and labor for carbon replacement)

Each of these components is discussed below. Energy costs per storm event were evaluated but were found to be negligible.

Cost Components

Maintenance Materials

An equation for the cost of annual maintenance materials was developed from CWC W/W Cost Program based on a raw water pumping station. It was assumed that the materials costs for a pump, which operates periodically, would be the same as those for a pump which operates on a more frequent basis. The firm capacity of the pump station was sized to drain the storage facility in 12 hours.

The resulting equation for the annual maintenance materials is:

Annual O&M Maintenance Materials $ = 2,786 * *storage volume* in MG + 2,483

Labor for Scheduled Inspections and Maintenance
This includes site visits, grounds and facility cleanup, testing equipment, and lubricating equipment, etc.

Costs were based:

- 4 hours per visit
- I visit per month (all year round)
- 2 people per visit
- Labor rate of $50 per hour

The resulting annual labor costs for maintenance and inspections are: $4,800

Maintenance Labor Following a Storm Event
Following each storm event, the storage facility would be dewatered and washed down to prepare for the next event. The amount of labor for a storage facility will depend on the degree of automation of the cleanup and how well the cleanup system works. It is assumed that the storage facility would be equipped with automated washdown system. Additional labor would be required to conduct final cleanup.

The following assumptions were made:

- 2 people
- 8 hours per person per event
- Labor rate of $50 per hour

The resulting equation for the maintenance labor following a storm event is:

Annual O&M Storm Event Maintenance Labor $ = 800 * *number of events per year*

Note that the volume of the basin used during an individual storm, relative to the size of the facility, is not accounted for in the equation. In reality, it would impact the clean-up labor involved. Generally, an off-line storage facility would be divided into basins which, would fill sequentially during a storm event. Cleaning would not be necessary in those basins which remain unused during a storm event.

Odor Control
The following assumptions were made regarding odor control:

- An 8-foot diameter scrubber would be required for a 2 MG storage facility. Scrubber size and costs for larger facilities would increase proportionally
- The carbon would be replaced once every three years.
- Costs for carbon equals $2.50 per pound (includes labor costs for replacement)
- Required carbon for 8-foot diameter scrubber is 4,820 lbs.

The resulting equation for odor control is:

Annual O&M Odor Control $ = 2,000 * *storage volume in MG*

Off-line Storage Equation

Combining the individual components presented above, the resulting equation for annual O&M costs for off-line storage is:

$ = (4,790 * storage volume in MG) + (800 * number of events per year) + 7,300

Example Calculation

For a 4 MG storage facility, which is used once every five years, the estimated annual O&M, is:

$ = (4,790 * 4) + (800 * 0.2) + 7,300 = 26,620